



United States  
Environmental  
Protection Agency  
Office of Air &  
Radiation  
Office of Air Quality  
Planning & Standards  
**FACT SHEET**



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**HEALTH AND ENVIRONMENTAL EFFECTS OF GROUND-LEVEL  
OZONE**

**Why are We Concerned about Ground-Level Ozone?**

Ozone is the prime ingredient of smog in our cities and other areas of the country. Though it occurs naturally in the stratosphere to provide a protective layer high above the earth, at ground-level it is the prime ingredient of smog. When inhaled, even at very low levels, ozone can:

- cause acute respiratory problems;
- aggravate asthma;
- cause significant temporary decreases in lung capacity of 15 to over 20 percent in some healthy adults;
- cause inflammation of lung tissue;
- lead to hospital admissions and emergency room visits [10 to 20 percent of all summertime respiratory-related hospital visits in the northeastern U.S. are associated with ozone pollution]; and
- impair the body's immune system defenses, making people more susceptible to respiratory illnesses, including bronchitis and pneumonia.

**Who is Most at Risk from Exposure to Ground-Level Ozone?**

- Children are most at risk from exposure to ozone: The average adult breathes 13,000 liters of air per day. Children breathe even more air per pound of body weight than adults.
- Because children's respiratory systems are still developing, they are more susceptible than adults to environmental threats.
- Ground-level ozone is a summertime problem. Children are outside playing and exercising during the summer months at summer camps, playgrounds, neighborhood parks and in backyards.
- Asthmatics and Asthmatic Children:
  - Asthma is a growing threat to children and adults. Children make up 25 percent of the population and comprise 40 percent of the asthma cases.
  - Fourteen Americans die every day from asthma, a rate three times greater than just 20 years ago. African-Americans die at a rate six times that of Caucasians.
  - For asthmatics having an attack, the pathways of the lungs become so narrow that breathing becomes akin to sucking a thick milk shake through a straw.

- Ozone can aggravate asthma, causing more asthma attacks, increased use of medication, more medical treatment and more visits to hospital emergency clinics.

- Healthy Adults:

- Even moderately exercising healthy adults can experience 15 to over 20 percent reductions in lung function from exposure to low levels of ozone over several hours.

- Damage to lung tissue may be caused by repeated exposures to ozone--something like repeated sunburns of the lungs -- and this could result in a reduced quality of life as people age.

Results of animal studies indicate that repeated exposure to high levels of ozone for several months or more can produce permanent structural damage in the lungs.

- Among those most at risk to ozone are people who are outdoors and moderately exercising during the summer months. This includes construction workers and other outdoor workers.

#### **How does Ground-Level Ozone Harm the Environment?**

- Ground-level ozone interferes with the ability of plants to produce and store food, so that growth, reproduction and overall plant health are compromised.

- By weakening sensitive vegetation, ozone makes plants more susceptible to disease, pests, and environmental stresses.

- Ground-level ozone has been shown to reduce agricultural yields for many economically important crops (e.g., soybeans, kidney beans, wheat, cotton).

- The effects of ground-level ozone on long-lived species such as trees are believed to add up over many years so that whole forests or ecosystems can be affected. For example, ozone can adversely impact ecological functions such as water movement, mineral nutrient cycling, and habitats for various animal and plant species.

- Ground-level ozone can kill or damage leaves so that they fall off the plants too soon or become spotted or brown.

These effects can significantly decrease the natural beauty of an area, such as in national parks and recreation areas.

- One of the key components of ozone, nitrogen oxides, contributes to fish kills and algae blooms in sensitive waterways, such as the Chesapeake Bay.

#### **What Improvement Would Result from EPA's New Standards?**

EPA's new ozone standards will provide increased protection beyond that provided by the previous standard from the following effects:

- Reduced risk of significant decreases (15% to over 20%) in children's lung functions (such as difficulty in breathing or shortness of breath), approximately 1 million fewer incidences each year, which can limit a healthy child's activities or result in increased medication use, or medical treatment, for children with asthma

- Reduced risk of moderate to severe respiratory symptoms in children, hundreds of thousands of fewer incidences each year of symptoms such as aggravated coughing and difficult or painful breathing
- Reduced risk of hospital admissions and emergency room visits for respiratory causes, thousands fewer admissions and visits for individuals with asthma
- Reduced risks of more frequent childhood illnesses and more subtle effects such as repeated inflammation of the lung, impairment of the lung's natural defense mechanisms, increased susceptibility to respiratory infection, and irreversible changes in lung structure. Such risks can lead to chronic respiratory illnesses such as emphysema and chronic bronchitis later in life and/or premature aging of the lungs
- Reduce the yield loss of major agricultural crops, such as soybeans and wheat, and commercial forests by almost \$500,000,000.

**Background: What is Ground-level Ozone?**

- Ozone is not emitted directly into the air, but is formed by gases called nitrogen oxides (NOx) and volatile organic compounds (VOCs) that in the presence of heat and sunlight react to form ozone. Ground-level ozone forms readily in the atmosphere, usually during hot weather.
- NOx is emitted from motor vehicles, power plants and other sources of combustion. VOCs are emitted from a variety of sources, including motor vehicles, chemical plants, refineries, factories, consumer and commercial products, and other industrial sources.
- Changing weather patterns contribute to yearly differences in ozone concentrations from city to city. Also, ozone and the pollutants that cause ozone can be carried to an area from pollution sources located hundreds of miles upwind.